CLAIMS

1. A semiconductor light-emitting element composed of at least compound semiconductors comprising an active layer consisting of a quantum well structure including a well layer and barrier layers between which said well layer is sandwiched, wherein said well layer has in part a doped well region to which an n-type impurity is added at the interface with said barrier layer on an electron injection side and in the vicinity of said interface, and wherein said barrier layer has a doped barrier region to which said n-type impurity is added at least at said interface and in the vicinity of said interface.

2. The semiconductor light-emitting element according to claim 1, wherein the film thickness t of said doped well region is in the range of $0 < t < (w/2)$, where w is the film thickness of said well layer.

3. The semiconductor light-emitting element according to claim 1 or 2, wherein said barrier layer has an undoped barrier region to which said n-type impurity is not added at the interface with said well layer on the hole injection side, and in the vicinity of said interface.

4. The semiconductor light-emitting element according to claim 3, wherein the film thickness of said undoped barrier region of said barrier layer is equal to or less than the film

thickness of said doped well region.

5. The semiconductor light-emitting element according to claim 1 or 2, wherein said doped barrier region spreads throughout said entire barrier layer.

6. The semiconductor light-emitting element according to any one of claims 1-5, wherein the crystalline structure of said active layer is a wurtzite structure, and the principal plane of said active layer is the (0001) plane.

7. The semiconductor light-emitting element according to any one of claims 1-6, wherein said compound semiconductor consists mainly of a group III nitride $B_{x'}Al_xGa_yIn_zN$ ($x' + x + y + z = 1$).

8. The semiconductor light-emitting element according to any one of claims 1-7, wherein said n-type impurity is Si or Ge.

9. The semiconductor light-emitting element according to any one of claims 1-8, wherein the concentrations of the n-type impurity in said doped well region and said doped barrier region are 8E17/cc to 1E19/cc respectively.

10. A method for manufacturing a semiconductor light-emitting element composed of at least compound

semiconductors including an active layer consisting of a quantum well structure having a well layer and barrier layers between which said well layer is sandwiched, said method comprising the steps of :

growing a barrier layer while adding an n-type impurity so that a doped barrier region to which said n-type impurity is added is formed to the uppermost surface; and

growing a well layer on said uppermost surface of the barrier layer while adding said n-type impurity to form a doped well region to which said n-type impurity is added on said uppermost surface servicing as an interface with said barrier layer on the electron injection side.

11. The semiconductor light-emitting element manufacturing method according to claim 10, where the film thickness t of said doped well regions is in the range of $0 < t < (w/2)$, where w is the film thickness of said well layer.

12. The semiconductor light-emitting element manufacturing method according to claim 10 or 11, wherein said barrier layer growing step includes a step in which undoped barrier regions to which said n-type impurity is not added are formed at the interfaces with said well layer on the hole injection side, and in the vicinity of these interfaces.

13. The semiconductor light-emitting element manufacturing method according to claim 12, wherein the film

thickness of said undoped barrier region of said barrier layer is equal to or less than the film thickness of said doped well region.

14. The semiconductor light-emitting element manufacturing method according to claim 10 or 11, wherein said doped barrier region is formed throughout said entire barrier layers in said step in which said doped barrier region is formed.

15. The semiconductor light-emitting element manufacturing method according to any one of claims 10-14, wherein said doped barrier region is formed so that the crystalline structure of said active layer is a wurtzite structure, and so that the principal plane of said active layer is the (0001) plane, in said step in which said doped barrier region is formed.

16. The semiconductor light-emitting element manufacturing method according to any one of claims 10-15, wherein said compound semiconductor consists mainly of a group III nitride $B_{x'}Al_xGa_yIn_zN$ ($x' + x + y + z = 1$).

17. The semiconductor light-emitting element manufacturing method according to any one of claims 10-16, wherein said n-type impurity is Si or Ge.

18. The semiconductor light-emitting element manufacturing method according to any one of claims 10-17, wherein

the concentrations of the n-type impurity in said doped well region and doped barrier region are 8E17/cc to 1E19/cc respectively.